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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Ruey-Yuan Han

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EXAMINER

KIM, CHONG R

ART UNIT

PAPER NUMBER

2623

DATE MAILED: 06/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/739,002

Applicant(s)

HAN, RUEY-YUAN

Examiner

Charles Kim

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 8-11 is/are rejected.
- 7) ☒ Claim(s) 2-7, 12 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment and Arguments

1. Applicant's amendment filed on March 22, 2004 has been entered and made of record.
2. In view of applicant's amendment, the objection to the claims are withdrawn.
3. Applicant's arguments have been fully considered, but they are not deemed to be persuasive for at least the following reasons.

Applicants argue (page 9) that "there is no motivation to modify Zhu with Sims". In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Zhu explains that "**any frequency/sequence domain transform** or other orthogonal transform in which signal energy is compressed into a relatively small number of components" can be utilized (col. 4, line 64-col. 5, line 2). The Examiner notes that the fast Fourier transform was an exceedingly well known type of frequency domain transform for compressing signal energy into a relatively small number of components. For example, Sims discloses a fast Fourier transform for correlation purposes (col. 1, lines 64-68). Therefore, the suggestion/motivation for modifying the frequency transform of Zhu so that it comprises a fast Fourier transform (as taught

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by Sims) would have been to compress the signal energy into a relatively small number of components, thereby enhancing the correlation process.

Applicants further argue (page 9) that “Zhu’s disclosed technique can only use a Hadamard Transform, and is incompatible with a Fast Fourier Transform, because Zhu teaches a MAD (Mean-Absolute-Difference) criterion for correlation”. The Examiner disagrees. Zhu explicitly states that **any frequency/sequence domain transform or other orthogonal transform** can be used, as noted above. Zhu also explicitly states that the minimum MSE criterion for correlation can be utilized instead of the MAD (col. 3, lines 47-64 and col. 5, lines 2-8); wherein the minimum MSE criterion is compatible with a fast Fourier Transform.

Applicants further argue (page 13) that “none of the equations in Zhu discloses or suggests the background correction term recited in the independent claims of the present invention”. The Examiner disagrees. As noted in the previous office action (page 3), a background correction term is an inherent feature in the MSE correlation criterion of Zhu (equation 1). The applicants themselves admit that “the expansion of the squared bracket of the MSE equation (equation 1) will lead to a background correction term” (page 13). Therefore, the combination of Zhu and Sims appear to still be applicable to the claims.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. Claims 1, 8-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Zhu, U.S. Patent No. 6,625,216 ("Zhu") and Sims et al., U.S. Patent No. 5,524,845 ("Sims").

Referring to claim 1, Zhu discloses a method for tracking an object in an image using transforms, comprising the steps of:

a. identifying a background correction term for a frequency (Hadamard) transform correlation tracker [col. 3, lines 21-63 and col. 4, lines 38-41. The Examiner notes that a background correction term is an inherent feature in the expansion of the minimum MSE criterion (equation 1), wherein expanding the equation squares the terms inside the bracket]

b. tracking the object based on a representation of the background correction term that includes the frequency domain sinc function [col. 4, lines 38-64. Zhu explains that the motion blocks and trial matching blocks are transformed into the frequency domain, and the resulting transformed blocks are correlated using the MSE matching criterion. The Examiner notes that transforming the blocks into the frequency domain will result in a frequency domain sinc function, since the frequency domain representation of a spatial block (rectangle) is a sinc function. The Examiner further notes that the frequency transform of the background correction term (noted above) is represented by a frequency domain sinc function].

Zhu further discloses a Hadamard frequency transform correlation tracker, but fails to explicitly disclose a Fast Fourier Transform correlation tracker. However, Zhu explains that "any frequency/sequence domain transform or other orthogonal transform in which signal energy is compressed into a relatively small number of components" can be utilized (col. 4, line 64-col. 5, line 3). The Examiner notes that Fast Fourier transforms were exceedingly well known types

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of transforms used to compress signal energy into a relatively small number of components, and commonly utilized in object tracking systems. For example, Sims discloses a Fast Fourier Transform correlation tracker for tracking an object in an image (col. 1, line 57-col. 2, line1).

Zhu and Sims are both concerned with tracking an object in an image. Zhu is concerned with a fast frequency transform algorithm that is simple to implement (Zhu, col. 4, lines 58-60). Sims provides a frequency transform (FFT) that is fast and simple, and allows real-time tracking capability (Sims, col. 1, lines 46-56). Therefore, it would have been obvious to modify the correlation tracker of Zhu so that it is a Fast Fourier Transform correlation tracker as taught by Sims, in order to enhance the processing speed of the tracking system by utilizing a fast and effective frequency transform algorithm.

Referring to claim 8, see the rejection of at least claim 1 above. Zhu discloses a method for tracking an object in an image using frequency transforms, comprising the steps of:

- i. transforming non-constant terms of a mean-square-error (MSE) function from the spatial domain into the frequency domain (col. 4, lines 38-41), wherein one of the non-constant terms is a background correction term and the frequency domain representation of the background correction term includes the 2-dimension sinc function (see the discussion of claim 1 above)

- ii. computing the non-constant terms in the frequency domain (col. 6, lines 26-30).

Zhu fails to disclose the step of transforming the computed non-constant terms from the frequency domain to the spatial domain to obtain a correlation surface. However, this feature was exceedingly well known in the art. For example, Sims discloses a step of transforming computed terms from the frequency domain to the spatial domain to obtain a correlation surface

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(col. 2, lines 1-3). The Examiner notes that the correlation surface taught by the combination of Zhu and Sims will have a minimum that corresponds to the location of the object in the image; since Zhu explains that the matching criteria is met when the MSE is minimized (col. 3, lines 41-43 and equation 2).

Zhu and Sims are both concerned with tracking an object in an image. Zhu is concerned with increasing the accuracy of the object tracking system (Zhu, col. 1, lines 50-52). Sims's method increases the accuracy of the object tracking process (Sims, col. 2, lines 40-43). Therefore, it would have been obvious to combine the teachings of Zhu and Sims, in order to increase the accuracy of the object tracking system.

Referring to claim 9, see the rejection of at least claims 1 and 8 above. Zhu discloses a method for tracking an object in an image using the first and third terms of a mean square-error function $C(s,t)$ [$MSE(d1,d2)$] defined as having three terms, wherein the first term is a background correction term [col. 3, lines 41-63]. The Examiner notes that expanding the minimum MSE criterion (equation 1) by squaring the terms inside the bracket will result in three terms, wherein the first term is a background correction term, as noted above], the method comprising the steps of:

- a. transforming the first and third terms into the frequency domain (col. 4, lines 38-41)
- b. computing the first term in real-time using a 2-dimension sinc function (see the discussion of claim 1 above)
- c. computing the third term (col. 4, lines 38-41).

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Zhu fails to disclose the step of transforming the computed first and third term out of the frequency domain to form a correlation surface. Sims teaches this feature as noted above (claim 8). Therefore, it would have been obvious to combine the teachings of Zhu and Sims, for the reasons stated above.

Referring to claim 10, Zhu further discloses that the mean-square-error function $C(s,t)$ [MSE(d1,d2)] is defined as:

$$C(s,t) = \frac{1}{N} \sum_N f^2(x,y) + \frac{1}{N} \sum_N g^2(x-s,y-t) - 2 * \frac{1}{N} \sum_N [f(x,y) * g(x-s,y-t)]$$

Zhu discloses the MSE function in col. 3, lines 47-54, more specifically equation 1. The Examiner notes that expanding the minimum MSE criterion (equation 1) by squaring the terms inside the bracket will result in an equation having the form above.

Referring to claim 11, see the rejection of at least claim 1 above. Zhu discloses a frequency transform correlation tracker, comprising a computing device with inputs for receiving an input search window (current frame) and receiving a reference window image (motion block), wherein the computing device tracks the reference window in the input search window based on a frequency domain background correction term that includes a 2 dimension sinc function (col. 3, lines 21-40 and the discussion of claim 1 above).

Allowable Subject Matter

5. Claims 2-7, 12-13 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Kim whose telephone number is 703-306-4038. The examiner can normally be reached on Mon thru Thurs 8:30am to 6pm and alternating Fri 9:30am to 6pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on 703-308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



ck

June 4, 2004


Jon Chang
Primary Examiner